MICROCYLLOEPUS FORMICOIDEUS (COLEOPTERA: ELMIDAE), A NEW RIFFLE BEETLE FROM DEATH VALLEY NATIONAL MONUMENT, CALIFORNIA[1]

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ABSTRACT: *Microcylloepus formicoideus* sp. nov. is described from Travertine Springs, Inyo Co., California. A survey of local permanent springs indicates that the species only exists at the type locality. Relationships with other congeners is discussed.

Microcylloepus was erected in 1935 by Hinton for the sole species *Stenelmis pusillus* LeConte. Since then, 24 other species have been added to the genus (Brown 1981). *Microcylloepus* is essentially a Neotropical element that has invaded the Nearctic. Within the US occur five described species and perhaps several undescribed species. The eastern *M. pusillus* has had four subspecies described but they represent only color morphs. Populations have been found that have all the morphs co-occuring. In the western Nearctic several species have been taken, particularly from warm springs in the Basin and Range desert. Also in the western US occurs *M. similis* Hinton which has long been considered to be a subspecies of *M. pusillus*. Although it resembles *M. pusillus* in many aspects, it is a valid species, as is seen with a side-to-side comparison and when examining the genitalia.

In the course of a survey of the riffle beetles of Death Valley two new species were discovered. One is described here; the second presents a more complicated problem requiring more analysis and will be described later.

Microcylloepus formicoideus new species

Body: Body elongate, parallel-sided (Fig. 1); 1.29-1.53 mm in length, 0.50-0.56 mm in width. Surface coarsely punctate and coarsely asperate; sculpturing very pronounced. Dorsum, head and hypomera black; sterna and legs rufous; antennae and palpi testaceous. Legs projecting well beyond sides of body.

Head: Head withdrawn into prothorax up to eyes. Dorsum densely granulate and punctate; setae thick, arcuate, decumbent and separated by approximately half their length. Genae and postocular areas smooth; setation fine, dense and decumbent. Frons with fronto-clypeal suture almost straight; angles slightly obtuse, raised, and continuing around base of antennae. Clypeus with apex broadly arcuate; angles broadly rounded. Labrum with apex straight, sides diverging slightly to base; surface shiny and alutaceous; setation sparse, fine and straight on disc and apically dense, coarse and curved. Mandibles

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with 3 short teeth; prostheca present; lateral lobe large. Maxillae with 4-segmented palp, last segment 2.5 times as long as wide, segments 1-3 subequal and half the length of the last; galea digitiform, apically with several stout curved setae; lacinia elongate-rectangular, fused to stipes, medially with several stout setae, apically with many stout setae with curved tips forming a multitiered brush; cardo subrectangular and divided by an oblique suture. Labium with 3-segmented palpi borne on short palpigers; mentum and submentum with numerous setae; prementum reduced to palpiger; ligula apically with 20-25 cultriform setae. Antennae 11-segmented with pedical and scape longer and wider than following segments except for eleventh which is twice as long as penultimate and cultriform.

Pronotum: Surface densely granulate and punctate, granules separated by own width, punctae smaller and contiguous. Length slightly greater than greatest width. Sides bisinuate, explanate and convergent both apically and basally; margins dentate; apices projecting beyond anterior margin. Disc in basal half with Y-shaped carina connecting to sublateral carinae; moderately convex in apical half; median longitudinal depression in middle half with length 3 times width. Sublateral carinae broken at one-half; basal pieces apically swollen.

Scutellum: Shape ovoid, widest near base; surface flat and granulate.

Elytra: Surface densely granulate and punctate; setation as on dorsum of head. Striae with punctae basally very large and nearly confluent, becoming smaller apically but extending almost to apex. Second, fourth and sixth intervals flat, almost obliterated basally by large punctae. First intervals slightly raised. Third, fifth and seventh intervals carinate, seventh interval carinae reaching almost to apex, third interval carinae reaching just past one-half, fifth interval carinae intermediate in length. Fifth and seventh intervals joined at humeri which are only slightly wider than base of pronotum. Epipleura extending almost to apex.

Wings: Only short basal portions remain.

Prosternum: Surface granulate with widely spaced setae. Anterior margin straight across middle with sides broadly rounded dorsally; margin projecting under head and covering most of mouthparts. Anterior half of prosternum strongly directed ventrally. Prosternal process depressed in middle and apically broadly rounded. Prosternal carinae prominent, broadly V-shaped and forming raised margins of prosternal process. Hypomera densely granulate and coarsely asperate. Episterna strongly directed dorsally.

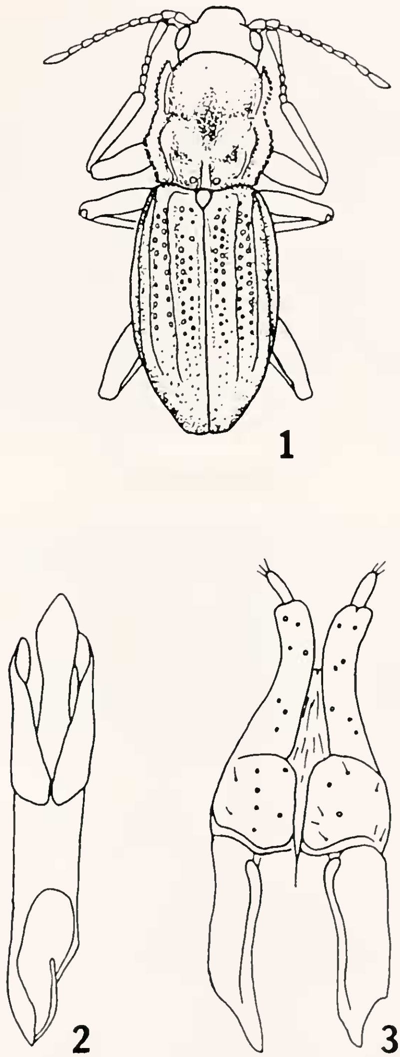
Mesosternum: Surface as on prosternum. Disc depressed and pentagonal; median longitudinal sulcus present on apical half; posterior margin raised and slightly arcuate. Mesosternal carinae prominent and bordering mesocoxal cavities.

Metasternum: Surface and sculpturing as in mesosternum. Median longitudinal sulcus deeper than mesosternal sulcus, cleft-like and in apical half of metasternum. Posterior margin arcuate. Metasternal carinae broadly divergent from base.

Legs: Legs long and narrow. Pro- and mesocoxae globular; metacoxae transverse. All coxal cavities open. Femora and tibiae long, subequal to pronotal length. All surfaces granulate, except for tarsomeres which have only scattered granules. Tarsi with two ventral rows of short, coarse setae. Last tarsomere with ventral apex prolonged into a tooth about as long as broad.

Abdomen: First sternite with prominent carinae strongly divergent in anterior half, then parallel or slightly convergent to posterior margin; disc anteriorly depressed and sloping up to posterior margin of sternite, asperate and with scattered large granules; sides directed dorsally. Second, third and fourth sternites similar; medially asperate with scattered large granules, number of granules declining posteriorly. Fifth sternite with only a few granules medially; lateral margins produced into teeth which clasp epipleura.

Genitalia: Male with median lobe constricted medially and broadly attenuated apically; parameres almost parallel-sided, apices curving under median lobe (Fig. 2). Female with sinuate baculi; hemisternites as long as broad; styli relatively short and curved (Fig. 3).



Figs. 1-3. *Microcylloepus formicoideus* sp. nov. 1, adult, dorsal view. 2, male genitalia. 3, female genitalia.

Tomentum: Occurs on genae, femora, medial surface of distal half of tibiae, pro- and mesepimera, lateral portions of meso- and metacoxae, and lateral portions of all abdominal sternites.

DIAGNOSIS

M. formicoideus is readily distinguished from all other North and Central American congeners by its small size and relatively long legs (these characters give the ant-like appearance that suggested its name). Also very diagnostic is the lack of distinct elytral humeri, a result of brachyptery (H. P. Brown, pers. comm.). This character is shared with *M. angustus* Hinton from Mexico (Hinton 1940). The latter is somewhat larger and possesses a distinctly different aedeagus. The male genitalia of *M. formicoideus* have parameres resembling those of *M. thermarum* Darlington while the median lobe is similar to that of *M. inaequalis* (Sharp) and *M. moapus* La Rivers. However, the genital characters involve subtle differences and Hinton (1940) notes that " a number of species may have the structure of the male genitalia identical."

TYPE LOCALITY

The type locality is: CA, Inyo Co., Death Valley National Monument (DVNM), 2.5 miles (4 km) east of Death Valley (along US Highway 190), Travertine Spring. The spring heads are numerous and their outflows combine while flowing southward toward the highway. Upon reaching the highway all flow is channeled into a concrete-lined canal that crosses under the highway and parallels it westward toward Furnace Creek Inn, the local hotel. *M. formicoideus* occurs in the spring heads and along the stream course almost to the road. Initially *M. formicoideus* occurs alone in the springhead but it is eventually replaced along the stream course by another congener.

An extensive survey of other DVNM water sources showed this to be the only locality where *M. formicoideus* occurs. The benthic community along the spring outflows is remarkably diverse and may represent the most diverse aquatic insect fauna in DVNM. This area and community certainly deserve protection and preservation. Texas Spring (which is closer to the hotel, campgrounds, date-palm orchard and visitors' center) has been completely diverted to human water uses. Whatever community was there is now lost. Because of the proximity of the two springs, and the great likelihood that their outflows were contiguous, their communities were probably the same. Thus the benthic community in Travertine Spring probably represents the only remaining portion of a much larger community.

TYPES

Holotype male, allotype female and 37 paratypes collected 23/I/1984 by WDS from Furnace Creek canal, a concrete canal diverting water to Furnance Creek Wash from Travertine Springs. Additional paratypes from the type locality include 53 collected by WDS on 16/IV/1984, 134 collected by Hugh Leech on 25/XII/1962, and 26 collected by Raymond Bandar on 25/XII/1962. The holotype, allotype and several paratypes will be deposited in the National Museum of Natural History at the Smithsonian Institution. Additional paratypes will be deposited in the collections of Harley P. Brown (Norman, OK), Louisiana State University (Baton Rouge, LA), William D. Shepard (Sacramento, CA), Death Valley National Monument museum (Death Valley, CA), the California Department of Food and Agriculture (Sacramento, CA) and Monte L. Bean Museum at Brigham Young University (Provo, UT). The Leech and Bander paratypes are in the collection of the California Academy of Sciences (San Francisco, CA).

ETYMOLOGY

The name *M. formicoideus* is chosen to note the slender body and long legs which give individuals an ant-like appearance.

DISCUSSION

In Brown (1972) this species keys to couplet # 70 which separates *M. browni* (Hatch) from *M. moapus*. *M. formicoideus* can be distinguished from *M. browni* by its smaller length and width. *M. formicoideus* can be distinguished from *M. moapus* by several characters: smaller size; black versus brown dorsal color; elytra with more pronounced carinae and punctae, surface more asperate and less shiny; anterior portion of prosternum more strongly directed ventrally. In Hinton's (1940) work on Mexican elmids, *M. formicoideus* keys to *M. angustus* from which it can be distinguished by several characters: general surface densely granulate; longer carina on third intervals; sides of prosternal process not parallel; metasternal carinae strongly divergent; first abdominal sternite with carinae parallel posteriorly.

M. thermarum is a closely related species from which *Microcylloepus formicoideus* varies in its more pronounced elytral sculpturing. In *M. thermarum* the third elytral intervals are only slightly prominent, the fifth intervals are flat and the seventh intervals have "fine, inconspicuous costae" (Darlington 1928).

This new species, with its putative close relationship with *M. moapus*, *M. thermarum*, and *M. angustus*, recalls La Rivers' (1949) prediction of intervening forms indicating all to be just intergrading populations of one species. While close examination reveals character differences equivalent to those between other species of *Microcylloepus*, one is led to wonder about the effects of the similar habitats in which these species live. Hinton (1940) doesn't mention the habitat for *M. angustus*, but all the rest come from warm springs. The relatively uniform warm temperatures may well alter developmental pathways leaving morphological variation canalized. Sweeney (1984) indicates that higher tempertures may maximize larval developmental rates leading to smaller than normal adults. Another species inhabiting warm springs in the Owens Valley of California has lost temporal synchronization of pupation (WDS, unpublished data). Alternatively, one may assume that this species group represents a different lineage from that including *M. pusillus*, which exists throughout the eastern half of the US. The genus is sorely in need of revision. Only then can questions of the source of variation in *Microcylloepus* be properly answered.

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Hugh Leech kindly loaned specimens from his collection and copies of portions of his personal field notes. Both Hugh Leech and Harley P. Brown provided copies of their correspondence regarding this species. The California Academy of Sciences provided space and equipment to study their specimens. The staff of Death Valley National Monument provided access to collecting sites, much information and other valuable assistance without which this work could not have been accomplished. Part of this study was accomplished during a summer research position at the University of Oklahoma. I thank H. P. Brown and C. B. Barr for reviewing the manuscript.

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SOCIETY MEETING OF MARCH 28, 1990
EVOLUTION AND HYBRIDIZATION OF ADMIRAL BUTTERFLIES
Dr. Austin P. Platt, Speaker

Insect taxonomists beware! If all groups are as interesting and complex as the butterfly genus *Limenitis*, most disputes between lumpers and splitters may never be resolved. Only in recent years, more than a century after the principal morphological types were described, has a reasonable understanding of the relationships among admiral butterflies emerged. As Nobelist Arthur Kornberg once said, "I have yet to see a complicated problem which, when looked at in the right way, doesn't become more complicated."

Dr. Austin P. Platt of the University of Maryland, Baltimore County, has studied the genetics and speciation of admiral butterflies for more than two decades. These well known and widely distributed butterflies include the viceroy, *Limenitis archippus*; the banded purple, *L. arthemis arthemis*; the red-spotted purple, *L. a. astyanax*; Weidemeyer's admiral, *L. weidemeyerii*; and Lorquin's admiral, *L. lorquini*. The latter four are really allopatric races of a single "super species" which, except for *arthemis* and *styanax*, rarely hybridize in the wild. Subspecies of the viceroy, *L. a. archippus* and *L. a. floridensis*, are mimics respectively of the monarch, *Danaus plexippus*, and the queen, *D. gilippus*. Similarly the red-spotted purple and Lorquin's admiral are thought to be mimics of the pipevine swallowtail, *Battus philenor*, and the California sister, *Adelpha bredowii*. Based on cladistic analyses and considerations of geographical distribution, all mimetic forms of *Limenitis* are probably derived from an ancestral form resembling the northern banded purple.

The banded phenotype is widespread in related genera and is controlled by a single autosomal gene. Genetic analyses of natural and laboratory hybrids between various species and subspecies of *Limenitis* indicate that several genes modify the banding pattern. Dr. Platt offered the intriguing hypothesis that the distinctive nonmimetic transvese black band on the hind wing of the monarch-like viceroy represents the vestige of a dark-margined white band that has collapsed as the result of modifying genes. The plausibility of this hypothesis was strengthened by comparing the wing patterns of hybrids between the viceroy and each of the members of the *L. arthemis* super species group that were displayed by Dr. Platt (See Bull. Ent. Soc. Am. (1983) 29(3): 10 - 20).

In addition to a discussion of the evolutionary relationships within *Limenitis*, Dr. Platt discussed their interesting life cycle. The eggs are commonly laid on willow or aspen leaves. They look like minature geodesic domes. The larvae that hatch from them establish characteristic feeding stations. In response to photoperiod, halfgrown 3rd instar larvae accumulate glycerol as a natural antifreeze and retreat to hibernacula in which they overwinter. These leaf-enclosed structures are easy to recognize and can be collected for population studies.

Dr. Platt's talk at the University of Delaware was attended by seventeen members and four guests.

- Harold B. White
Corresponding Secretary